

Fish Return System Efficacy and Monitoring Studies for JEA's Northside Generating Station

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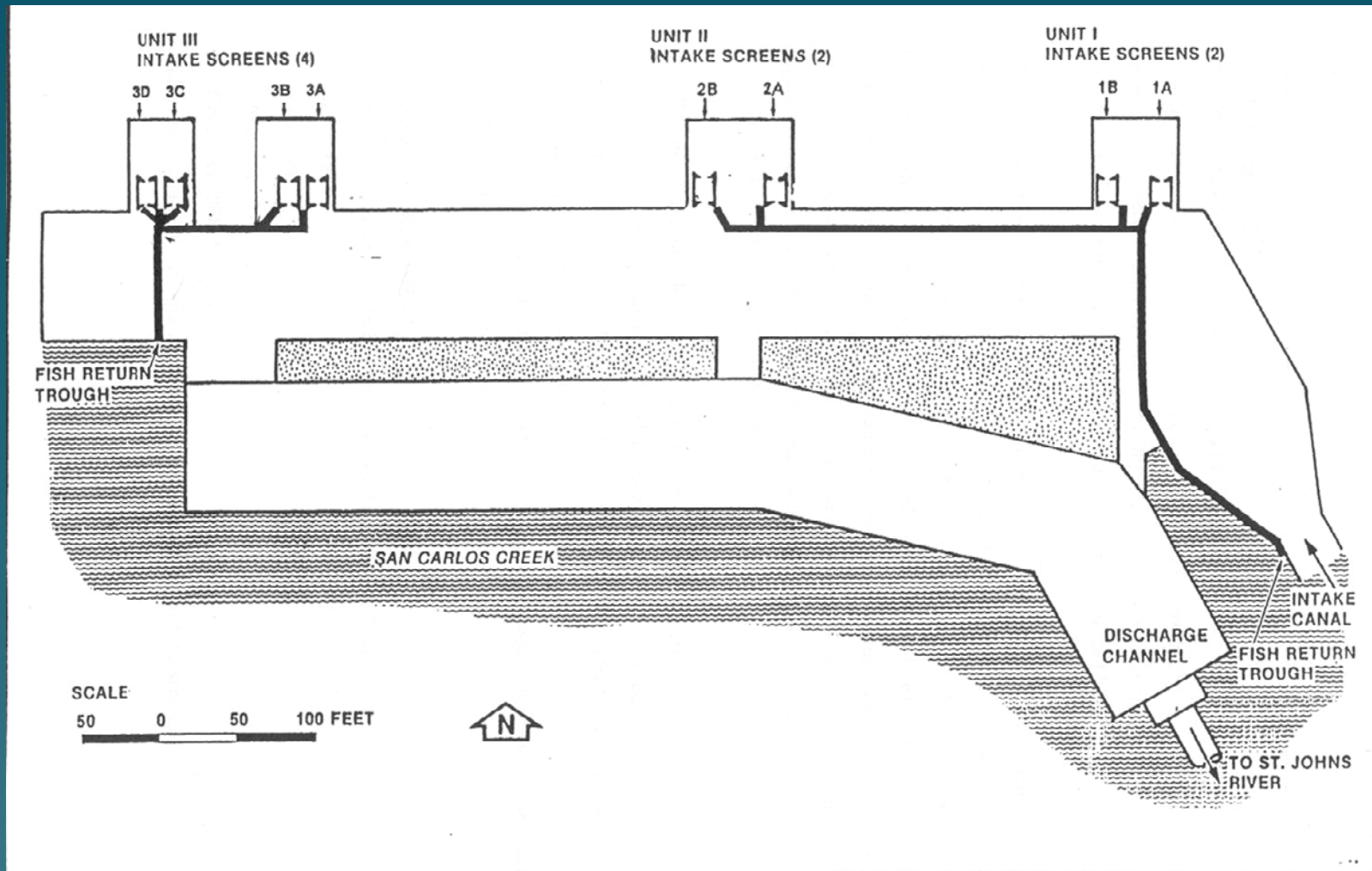








Fish Return System



Fish Return System



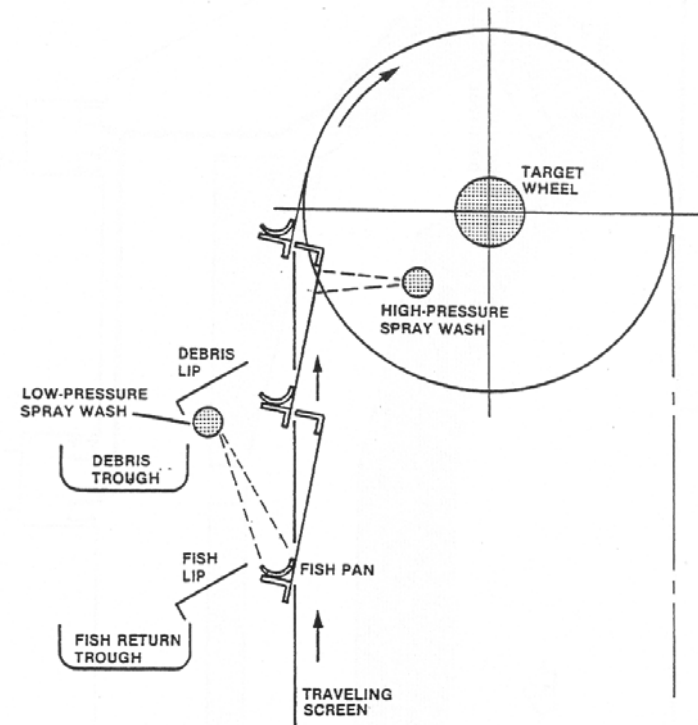
Fish Return Trough



Fish Return Trough



Traveling Screen and Wash System



Studies

- ◆ 316 Demonstration (1976)
- ◆ Monitoring Study of Aquatic Communities (1980)
- ◆ Impingement/Survivability Study, continuous operation of FRS (1985)
- ◆ Fish Return Optimization Study, intermittent operation rate study (1999)

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Impingement/Survivability Study

- ◆ NPDES permit requirement
- ◆ Study purpose was to determine the effectiveness of the FRS
 1. Define the types of organisms impinged
 2. Describe the physical condition of the aquatic organisms after passing through the FRS
 3. Quantify 4-day survivability post FRS

Impingement/Survivability Study

- ◆ All FRS onsite were evaluated
- ◆ Summer and winter conditions
- ◆ Studies conducted during anticipated periods of peak impingement
- ◆ Scope of work approved by EPA

Survivability Studies

- ◆ Assess the effectiveness of the FRS by determining the survival rates of three classes of impinged organisms
- ◆ Vulnerable or sensitive species likely to be harmed
- ◆ Species of intermediate tolerance
- ◆ Tolerant or hardy species likely to pass through the FRS unharmed

Vulnerable Species

- ◆ Spotted seatrout
- ◆ Anchovy
- ◆ Silversides
- ◆ Menhaden

Intermediate Tolerance

- ◆ Atlantic croaker
- ◆ Spot
- ◆ Mullet
- ◆ Star drum

Tolerant or Hardy Species

- ◆ Commercial shrimp
- ◆ Blue crab
- ◆ Hogchoker
- ◆ Hardhead catfish

Species Selection for Survivability Tests

- ◆ One representative genus or species was selected from each of the categories
- ◆ Species selection depended on their impingement rates and commercial importance
- ◆ All species tested were pre-approved by EPA Region IV

Survivability Tests

- ◆ Approximately 20 individuals from each group were monitored for survival after passing through the FRS
- ◆ Test chambers were 20-gallon aquaria with flow-through water
- ◆ 10 individuals per aquarium
- ◆ Control organisms were collected from San Carlos Creek and St. Johns River, and handled similarly

Survivability Results

Summer conditions

- ◆ Control survival > 95 percent for all three classes of organism sensitivity
- ◆ No survival of sensitive species, spotted seatrout (all died within 1 hour of passage through FRS)
- ◆ 80 percent survival of intermediate species, spot and Atlantic croaker
- ◆ 90 percent survival of tolerant species, commercial shrimp

Survivability Results

Winter conditions (air temp. ~ 0 °C)

- ◆ Control survival 100 percent for sensitive and intermediate species; 75 percent survival of tolerant species (catfish)
- ◆ 5 percent survival of sensitive species, Atlantic menhaden (15 percent survival after 24 hours)
- ◆ 10 percent survival of intermediate species, Star drum
- ◆ 90 percent survival of tolerant species, catfish

Survivability conclusions

- ◆ The sensitive species impinged and returned by the FRS had poor survival (<5 percent)
- ◆ The intermediate species impinged had good survival during summer conditions (80 percent), but poor survival under winter conditions (10 percent)
- ◆ The tolerant species (commercial shrimp and catfish) had good survival (>90 percent)

FRS Return Rate Studies

- ◆ Comparison of total number of organisms impinged with number returned via FRS
- ◆ Organisms collected over two 4-hour periods, prior to high tide and prior to low tide
 - ◆ Summer and winter conditions
- ◆ Data collected: total number and species of organisms returned via FRS, and number disposed via debris system
 - ◆ Estimated total number impinged and percent returned

FRS Return Rate

Summer conditions

- ◆ Return rate was 73 percent for low-tide period (penaeid shrimp and blue crab accounted for 90 percent of the organisms impinged, total of 150 organisms)
- ◆ Return rate was 79 percent for high-tide period (pink shrimp accounted for 81 percent of organisms impinged, total of 42 organisms)

FRS Return Rate

Winter conditions

- ◆ Return rate was 49 percent for low-tide period
 - ◆ 8 fish species
 - ◆ 2 shrimp species
 - ◆ Total of 75 organisms
- ◆ Return rate was 56.5 percent for high-tide period
 - ◆ 13 fish species
 - ◆ 2 shrimp species
 - ◆ Catfish and star drum were most abundant
 - ◆ Total impinged 1,537

Return Rate Conclusions

Impingement study showed:

- ◆ Summer conditions, 74.5 percent of impinged organisms were returned
- ◆ Winter conditions, 56 percent of impinged organisms were returned
- ◆ Impingement rates were higher during the winter and at night

Conclusions

- ◆ The sensitive species impinged and returned by the FRS had poor survival during summer and winter (<5 percent)
- ◆ Winter conditions resulted in poor survival of intermediate species (10 percent)
- ◆ Higher rates of impingement were observed in the winter and at night
- ◆ Winter conditions resulted in lower return rates, 56 percent vs. 74.5 percent

FRS Optimization Study Conclusions

- ◆ Compared immediate survival post FRS, 96-hour survival, and return rate efficiency (quarterly)
- ◆ Continuous FRS operation, 1.5-hr off/0.5-hr on, and 3.5-hr off/0.5-hr on
- ◆ 3.5-hr off/0.5-hr on resulted in significant mortality
- ◆ 1.5-hr off/0.5-hr had similar results to continuous operation, except summer nights
- ◆ Intermittent schedule approved by FDEP (summer nights continuous operation)
- ◆ Resulted in 58 percent reduction in operation time for the FRS without affecting their performance

